

Aerated Manure-pit Management: A Case Study of Cost and Economic Value

¹Cuong Manh Duong and ²Teng-Teoh Lim

¹*Plant Science & Technology, University of Missouri, Columbia MO 65201, USA; Faculty of Biotechnology and Food Technology, Thai Nguyen University of Agriculture and Forestry, Thai Nguyen, Viet Nam*

²*Plant Science & Technology, University of Missouri, Columbia MO 65201, USA*

Abstract

Aeration has been applied recently as a supplementary approach for manure management in several farms in Europe and USA. The compressed air injected into the pit was supposed to homogenize the manure and preserve its nutrient contents effectively. This case study evaluated installation and operating costs of an aerated system, and manure values when the technology was adopted to a 3,496 m² deep-pit floor of a 14.6 x 119.5 m barn containing 1,120 finishing cattle. The system included three units, each having two 1.7 kWh compressors, running 15 h/day to provide air through a network of 320 valves. A 14.6 x 110.3 m nearby barn without an aerated system from the same farm, housing 1,080 animals, was included for comparison. The consistency of the moisture content and concentrations of key nutrients were evaluated during the period of seven months, from June to December 2022. Based on recent surveys, installation costs, including equipment, labor, and annual maintenance expenses, were evaluated for further reference. Slight increases in total ammonium and phosphorus concentrations were observed in the aerated pit, at 0.74% and 0.50%, respectively, compared to the control barn. Meanwhile, a 4.54% decrease in potassium level was observed in the treated system, although the difference was not significant ($p > 0.05$). Applying the system could result in an installation cost of \$229,120 along with an additional annual cost of \$14,788 when evaluating a 40,000 ft² (3,716-m²) floor-size operation housing 11,000 animals. However, the manure nutrients could contribute to the annual capital value of \$114,830, an important factor in reducing the on-farm operating cost while providing an additional income.

Keywords: Manure management, Nutrient content, Slurry manure, Deep-pit storage, Aerated system, Livestock barn